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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,655	06/27/2003	Christopher L. Coleman	10030279-1	2630

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EXAMINER	
CHANG, AUDREY Y	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 01/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/607,655	COLEMAN, CHRISTOPHER L.	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 October 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5 and 7-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5 and 7-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Remark

- This Office Action is in response to applicant's amendment filed on October 25, 2004, which has been entered into the file.
- By this amendment, the applicant has amended claims 1 and 16, has canceled claim 6 and has newly added claims 21-24.
- Claims 1-5, and 7-24 remain pending in this application.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. **Claims 16-24 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 16 has been amended to include the phrase "the substrate configured to focus infrared light". However the specification fails to teach such. The specification **only** teaches that the substrate having the diffraction grating is configured to *scatter* infrared light. One skilled in the art would understand that scattering and focusing are two completely different optical functions.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-4, and 7-8 are rejected under 35 U.S.C. 102(e) as being anticipated by the patent issued to Unno et al (PN. 6,641,985).

Unno et al teaches a *diffractive optical element* and a *method* for making it, wherein the diffractive optical element, (please see Figures 3 and 4), comprises a *quartz substrate*, (21) having *surface relief pattern* formed on a first side of the substrate, and an *anti-reflection coating* (layer 22, in Figure 3 or multilayer 23-24 in Figure 4), formed on the surface relief pattern wherein the anti-reflective coating has substantially the *same dimension* or *width dimension* as the surface relief pattern, (please see column 5, lines 20-55).

Claim 1 has been amended to include the feature that the anti-reflection coating formed on the surface relief pattern *by a directional deposition technique*. However, the *product-by-process limitation* is not given any patentable weight since the process "directional deposition technique" is a commonly known film deposition method in the art that does not differentiate the product, i.e. the deposited anti-reflection coating on the surface of relief pattern, from the prior art diffractive optical element having the same structure.

With regard to claim 2, the quartz substrate (SiO_2) is a semiconductor substrate.

With regard to claim 3, the diffractive optical element forms a transmission grating.

With regard to claim 4, Unno et al teaches that the anti-reflective coating comprises *dielectric* layer materials such as metal oxide, (please see column 5 and line 43).

With regard to claims 7-8, Unno et al teaches that the surface relief pattern comprises a *first set of surfaces* that are *parallel* to the longitudinal surface of the substrate and are coated with the anti-reflective

coating and comprises a *second set of surfaces* that are *perpendicular* to the longitudinal surface of the substrate that are not coated with or *free from* the anti-reflective coating, (please see Figures 3 and 4).

This reference has therefore anticipated the claims.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Unno et al and in view of the patent issued to Tran et al (PN. 5,853,960).

The diffractive optical element taught by **Unno** et al as described for claim 1 above has met all the limitations of the claims. Unno et al teaches that the anti-reflective coating may be formed by dielectric layer material such as metal oxides, however it does not teach explicitly that it also includes the materials claimed, (i.e. silicon dioxide and silicon nitride etc.). But these materials are extremely well known dielectric materials for making anti-reflective coating, as demonstrated by the teachings of **Tran** et al, (please see column 9, lines 7-19). It would then have been obvious to one skilled in the art to apply the teachings of **Tran** et al to modify the anti-reflective coating of **Unno** et al to utilize dielectric materials such as silicon dioxide or silicon nitride for the benefit of making the anti-reflective coating with desired optical characteristics. It further has been held that it is within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

7. Claims 9-11, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Unno et al.

Unno et al teaches a *diffractive optical element* and a *method* for making it, wherein the diffractive optical element, (please see Figures 3 and 4), comprises a *quartz substrate*, (21) having *surface relief pattern* formed on a first side of the substrate, and *an anti-reflection coating* (layer 22, in Figure 3 or multilayer 23-24 in Figure 4), formed on the surface relief pattern wherein the anti-reflective coating has substantially the *same dimension* as the surface relief pattern, (please see column 5, lines 20-55).

This reference has met all the limitations of the claims. Unno et al teaches that the anti-reflective coating may be **deposited** directly on the substrate or **deposited** on the underlying film (12). However Unno et al does not teach explicitly that the anti-reflective coating is *deposited directionally* via the deposition process such as sputtering. **Unno** et al *does teach* explicitly that the underlying layer film (12) that is dielectric in nature can be deposited on the substrate using *directionally selective deposition* process via *sputtering* system, (please see Figure 2 and column 4, lines 27-37, and 55-64). It would then have been obvious to one skilled in the art to apply the explicitly teachings of deposition process and system disclosed by Unno et al to also carry out the deposition of the antireflective coating for the benefit of using the same and conventional arrangement to form the coating to save the manufacturing cost.

With regard to claim 10, the quartz substrate (SiO_2) is a semiconductor substrate.

With regard to claim 11, Unno et al teaches that the anti-reflective coating comprises dielectric layer materials such as metal oxide, (please see column 5 and line 43).

With regard to claim 15, the sputtering system is disclosed in Figure 2.

8. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Unno et al as applied to claim 9 above, and further in view of the patent issued to Tran et al.

The *diffractive optical element* taught by **Unno** et al as described for claim 9 above has met all the limitations of the claims. Unno et al teaches that the anti-reflective coating may be formed by

dielectric layer material such as metal oxides, however it does not teach explicitly that it includes the materials claimed, (i.e. silicon dioxide and silicon nitride etc. in claim 12). But these materials are extremely well known dielectric materials for making anti-reflective coating, as demonstrated by the teachings of **Tran** et al, (please see column 9, lines 7-19). It would then have been obvious to one skilled in the art to apply the teachings of **Tran** et al to modify the anti-reflective coating of **Unno** et al to utilize dielectric materials such as silicon dioxide or silicon nitride for the benefit of making the anti-reflective coating with desired optical characteristics. It further has been held that it is within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regard to claims 13-14, Unno et al teaches conventional film deposition systems, such sputtering system and vacuum deposition system can be used to deposit the film, (please see column 4, lines 27-32). However it does not teach explicitly that the anti-reflective coating may also be deposited by *electron beam evaporation process*. But electron beam evaporation process is an *equally well known* coating process for making anti-reflective coating as taught by **Tran et al** (please see column 9, lines 7-19). It would then have been obvious to one skilled in the art to apply the teachings of Tran et al to use the electron beam evaporation process as an alternative method for forming the anti-reflective coating for the benefit of using alternative yet well-known process to form the coating.

9. Claims 16-20, and newly added claims 21-22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Unno et al (PN. 6,641,985) in view of Kato et al (PN. 6,476,968).

Unno et al teaches a *diffractive optical element* and a *method* for making it, wherein the diffractive optical element, (please see Figures 3 and 4), comprises a *quartz substrate*, (21) having *surface relief pattern* formed on a first side of the substrate, and an *anti-reflection coating* (layer 22, in Figure 3

or multilayer 23-24 in Figure 4), formed on the surface relief pattern wherein the anti-reflective coating has substantially the *same dimension* or *width dimension* as the surface relief pattern, (please see column 5, lines 20-55).

Claim 16 has been amended to include the feature that the substrate having the diffracting features is configured to *focus* infrared light. The feature concerning the "focus" is rejected under 35 USC 112, first paragraph, for the reasons stated above. This feature is examined with the interpretation that the diffractive feature is configured to *diffract* infrared light. Unno et al does not teach such explicitly. However Unno et al **does** teach **explicitly** the theoretical equations for designing the diffractive feature in terms of design wavelength, namely Unno et al teach explicitly about the steps height for the diffractive feature in terms of wavelength of interest, (please see equations 2-4, and column 5, lines 42-56 for the anti-reflection coating also). From these equations, one skilled in the art can easily plugging the number for the infrared light wavelength, (i.e. greater than 700 nm), to design the diffractive optical element that is capable of diffracting infrared light. **Kato** et al in the same field of endeavor teaches that diffractive optical elements can be used with infrared light for a varieties of optical applications such as photographic and exposure systems, (please see column 1, lines 6-11). It would then have been obvious to one skilled in the art to take the design formula of Unno et al to design the diffractive optical element to diffract infrared light for the benefit of utilizing the diffractive optical element in infrared photographic or exposure systems.

With regard to claim 17, the quartz substrate (SiO_2) is a semiconductor substrate.

With regard to claim 18, Unno et al teaches that the anti-reflective coating comprises *dielectric* layer materials such as metal oxide, (please see column 5 and line 43).

With regard to claim 19, Unno et al teaches that the anti-reflective coating may be **deposited** directly on the substrate or **deposited** on the underlying film (12). However Unno et al does not teach explicitly that the anti-reflective coating is *deposited directionally* via the deposition process such as

sputtering. **Unno** et al *does teach* explicitly that the underlying layer film (12) that is dielectric in nature can be deposited on the substrate using *directionally selective deposition* process via *sputtering* system, (please see Figure 2 and column 4, lines 27-37, and 55-64). It would then have been obvious to one skilled in the art to apply the explicitly teachings of deposition process and system disclosed by Unno et al to also carry out the deposition of the antireflective coating for the benefit of using the same and conventional arrangement to form the coating to save the manufacturing cost.

With regard to claim 20, Unno et al teaches that the surface relief pattern comprises a *first set of surfaces* that are *parallel* to the longitudinal surface of the substrate and are coated with the anti-reflective coating and comprises a *second set of surfaces* that are *perpendicular* to the longitudinal surface of the substrate that are not coated with or *free from* the anti-reflective coating, (please see Figures 3 and 4).

With regard to newly added claims 21-22, Unno et al teaches explicitly that the optical thickness of the antireflective coating is a multiple of a quarter of a wavelength of interest, (please see column 5, lines 42-56), this means that for infrared light, which has a wavelength greater than 700 nm, one quarter of it is greater than 170 nm. It would have been obvious to one skilled in the art to make the antireflective coating has an optical thickness greater than 170 nm in order for it to be workable in the infrared light for the benefit of allowing the diffractive optical element applicable in optical system using infrared light.

With regard to newly added claim 24, as shown in Figure 3, Unno et al teaches that the diffractive optical element has evenly spaced grooves.

10. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Unno et al and Kato et al as applied to claim 16 above, and further in view of the patent issued to Knapp et al (PN. 6,077,569).

The diffractive optical element taught by **Unno** et al in combination with the teachings of **Kato** et al as described for claim 16 above have met all the limitations of the claims with the exception that these

references do not teach explicitly that the antireflective coating comprises titanium oxide. However titanium oxide is one of the most well know dielectric materials for making antireflective coating as shown by the teachings of **Knapp** et al, (please see column 1, lines 34 to 67). It would then have been obvious to one skilled in the art to use titanium oxide as an alternative choice for making the antireflective coating for the benefit of its suitability and its higher refractive index that requires less physical thickness of the layer to be used which then saves the cost of making the layer.

Response to Arguments

11. Applicant's arguments filed October 25, 2004 have been fully considered but they are not persuasive. The newly amended claims and newly added claims have been fully addressed and they are rejected for the reasons stated above.

In response to applicant's arguments which states that Unno et al does not teach or suggest that the antireflective coating formed on the surface relief pattern by "directional deposition process", the applicant is respectfully noted that such explicitly teachings are not relied upon to reject the claims. The feature "the coated surface relief pattern has substantially the same dimensions as the underlying surface relief pattern" is not in the claims and therefore cannot be relied upon to overcome the rejections. Unno et al teaches that the dielectric layers can be deposited by many conventionally known deposition processes, that include sputtering system, vacuum deposition system, plasma-enhanced CVD system , and RF sputtering process, (please see column 4, lines 28-37). The RF sputtering process is known in the art as magnetron sputtering process which is a directional deposition process. Although Unno et al does not teach explicitly that the layers for the antireflective coating, which are dielectric in nature, are formed by the directional deposition process, however they have to be formed by one of these well known standard deposition processes, and very likely to be formed by the process particular taught in the disclosure since it is nature for one skilled in the art to use the same deposition process for forming the layers.

Furthermore, as disclosed by the instant application, the antireflective coating can be either deposited by directionally deposition process or **any other conventional sputtering process** such as DC or RF sputtering process, (please see page 6, lines 6-19). **Applicant's own disclosure** indicates that the deposition process is *not novel* and it does not differentiate the diffractive optical element made by the process from the element made by any other conventional deposition process. The feature concerning deposition process therefore is not a patentable distinction.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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